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THE STORAGE AND MARKETING OF SWEET POTATOES.

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., September 21, 1912.

SIR: I have the honor to transmit herewith a manuscript entitled "The Storage and Marketing of Sweet Potatoes," by Mr. W. R. Beattie, Assistant Horticulturist, and recommend that it be published as a Farmers' Bulletin.

The increased demand for sweet potatoes during the late winter and early spring months has given rise to numerous inquiries regarding the best methods of storing and marketing the crop. In order to supply this information the accompanying bulletin has been prepared.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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THE STORAGE AND MARKETING OF SWEET POTATOES.

INTRODUCTION.

Each year the sweet potato is becoming of greater importance as a commercial truck crop in the United States. During a long period it has formed one of the principal sources of food for the people of the Southern States and tropical America. As a commercial truck crop the sweet potato would be included among the five of greatest importance, ranking perhaps about third in the list. As a food for the great mass of the people living in the warmer portions of our country the use of this crop is exceeded only by hominy and rice. The larger cities of the eastern United States are well supplied with sweet potatoes during a considerable portion of the year, but no provision has yet been made for many of the markets of the extreme North and Northwest.

The sweet potato is especially adapted for growing on the thin, sandy, cut-over timber lands of the South; in fact, the potatoes grown on this character of soil are more uniform in size and shape and keep better than those grown upon the richer alluvial soils. A great opportunity is afforded the farmers of this region to develop the sweet-potato industry, depending upon the Rocky Mountain and Great Plains area for a market.

Sweet potatoes can be marketed to greater advantage when storage facilities are provided. Growers who do not have suitable storage facilities are compelled to sell their sweet potatoes for a low price at digging time, while comparatively high prices prevail during the remainder of the year.

The proper keeping of sweet potatoes requires that they be (1) well grown and thoroughly ripened; (2) free from disease; (3) carefully handled in digging and storing; and (4) stored in a dry, well-ventilated place where proper temperatures can be maintained.

The first essential is met by growing the sweet potatoes on land adapted to the crop and in giving good cultivation.

The second essential, freedom from disease, requires the careful selection of seed potatoes, the use of new soil in the plant bed each year, and the following of a crop rotation in the field, so that sweet

potatoes will not be planted on the same land oftener than once in three years. One of the best ways to keep the crop free from disease is to grow the seed stock from vine cuttings planted on land where sweet potatoes have not been grown for several years. Diseased and decayed sweet potatoes should not be thrown in the manure or on land where the crop is to be grown. A safer plan would be to burn all infected potatoes and refuse.

The third essential lies in the care exercised in handling the potatoes at the time of digging and storing. Padded baskets and wagons with easy springs are recommended for use in transporting them from the field to the storage house.

The fourth essential, proper storage facilities, may easily be provided on almost any farm in the South, especially where lumber is cheap and wood or other fuel abundant.

THE CONSTRUCTION OF STORAGE HOUSES.

The farmers of the South, who as a rule grow only a few acres of sweet potatoes, follow the practice of storing them in pits or banks.



FIG. 1.—A small sweet-potato storage house.

When free from disease at the time of storing, this method has proved fairly successful for keeping the hardy varieties of sweet potatoes commonly grown in the Southern States, but the more delicate Jersey type, which is in demand in the northern markets, can not be successfully stored in this way. There is no difficulty, however, in

the keeping of sweet potatoes if they are free from disease, carefully handled, and stored under proper conditions.

Two or three types of sweet-potato storage houses are used by growers in the northern part of the sweet-potato region. One consists of a building which is constructed entirely above ground and is provided with double walls, a plank, concrete, or earth floor, bins for holding the stored potatoes, and suitable heating and ventilating facilities (fig. 1). Figure 2 shows a cross section of this type of house.

Another type of storage, used by growers in New Jersey, consists of a basement under the dwelling itself or under an outbuilding, but only part way under ground and provided with plenty of windows for ventilation. A basement storage must be dry to insure the keep-

ing of the potatoes, and it is doubtful if this type will prove satisfactory in the Gulf Coast States. The method of heating a storage cellar of this character is practically the same as for the regular storage house, that is, by means of a wood or coal stove. Where a steam or hot-water outfit is used for heating the dwelling, it also may be employed for heating the storage cellar. Figure 3 shows a cross-section plan of a basement storage for sweet potatoes.

In both of the foregoing types of storage the potatoes are placed in bins rather than directly on the floor. As a rule, 2 by 4 inch or 2 by 6 inch scantlings are placed on edge for sleepers, and a floor of 1 by 4 inch slats is laid on these, leaving $\frac{1}{2}$ -inch spaces between the slats. The sides of the bins are constructed by setting 2 by 4 inch scantlings

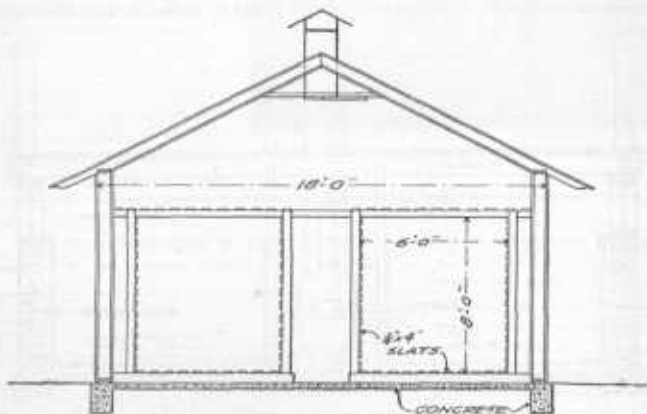


FIG. 2.—Cross section of a sweet-potato storage house.

upright and nailing 1 by 4 inch strips to them. The slats forming the sides are placed a little farther apart than those of the floor. In no case should the potatoes be piled directly against the walls of the storage house. A space of 6 to 8 inches should be left between the bins and the outside wall, and the bins themselves should be separated at least 4 inches to insure insulation and a free circulation of air. Frequently the storage bins are constructed of small round poles that have been cut in the woods and allowed to season. These will answer as well as sawed lumber, but the bins are not quite so easily constructed.

In some cases the raised floor is dispensed with and the potatoes stored upon a bed of pine needles or straw 2 or 3 inches deep. Even

where the slat floor is used, dry pine litter is frequently scattered over the slats to prevent bruising the potatoes.

The dimensions of the house will depend upon the quantity of potatoes to be stored. As a rule, the house should be rather long and narrow with a passageway running through the center and the bins on either side. The bins themselves should not be more than 8 by 10 feet, but 6 by 10 feet is a better size. It is desirable to have each bin of such size that the entire contents can be removed at one time. If it is intended to ship carload lots, the bins should be planned so that the contents of two, three, or four bins will fill a car, depending on the size of the bins. By building the house 18 or 20 feet wide the bins can be 6 or 7 feet deep on either side of a 4-foot passageway and still allow plenty of ventilation between the bins and

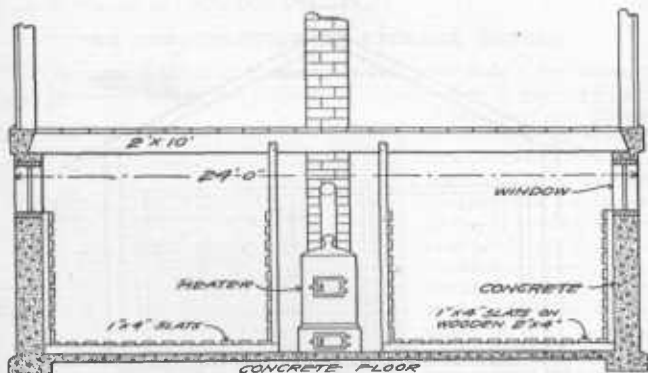


FIG. 3.—Cross section of a basement storage for sweet potatoes.

the outside walls. In the cellar type of storage in common use in New Jersey, entrance is made through an outside doorway, reached by an easy stairway or by an inclined passageway. The bins are arranged around the walls of the storage room. The stove, which is usually required for heating the room during the curing and storage period, is located as near the center of the room as possible.

A type of storage house that has proved very satisfactory throughout the Southern States is an outdoor cellar built on high, well-drained ground. On a line of posts is placed a ridgepole, against which split timbers, poles, or planks are arranged A fashion with one end on the ground. A layer of pine brush is placed upon the timbers and covered with 6 or 8 inches of earth. Bermuda grass is planted in the earth covering to prevent its washing away. Doors

are placed in either end, and one is sometimes placed midway in the side wall. Ventilators are inserted near the ridge at intervals of 10 or 12 feet and stove flues provided. It is advisable to place a stove at each end, just inside the door, where it can be conveniently tended, and by opening the ventilators near the middle of the house the heat will be distributed uniformly. A cellar of this type is shown in figure 4. More elaborate outdoor cellars of this type are shown in figures 5 and 6. The storage house shown in figure 6 has a stone foundation and the upper part of the structure is ceiled to make it frost proof. No bins are provided, the potatoes being placed in long piles on the earth floor or on a bed of pine needles. Ordinarily the piles run lengthwise of the house and are not over 3 feet in height.



FIG. 4.—An outdoor cellar or dugout for the storage of sweet potatoes.



FIG. 5.—A sweet-potato storage house built partially under ground.

The main requisite in the construction of a sweet-potato storage house is to secure reasonable warmth at all times and freedom from moisture. One disadvantage in a double-construction ceiled house is the formation of moisture upon the ceiling during cold weather and its dripping upon the stored potatoes. However, if nailing strips are first fastened to the rafters and the ceiling boards run from the ridge to the plate, the moisture will be carried down a slope to the side of the house and will not drip upon the potatoes. This difficulty is not often encountered in the cellar type of storage house or in the outdoor cellar covered with earth. A storage house need not be expensive, as the cheapest materials may be used. Rough lumber with the cracks battened will serve for the outer covering and similar

material lined with building paper will do for the interior. The storage bins may be constructed of the cheapest sawed lumber and the roof of corrugated iron, shingles, or a good grade of roofing paper. The space between the siding and the inner lining of the building

should not be filled with sawdust or other material, but should be left as a dead-air space.

In localities where the soil and climate are sufficiently dry, cellar storage, either independent or underneath a building, can be made satisfactory. Reasonable dryness is necessary to success in any storage house, and economical



FIG. 6.—A sweet-potato storage house built partially under ground upon a stone foundation.

operation depends on the ease with which a uniform temperature can be maintained. In the cellar type of storage, variations in temperature are slight under ordinary conditions. Perhaps no type of storage keeps so even a temperature as the outdoor cellar. The heavy covering of earth is a good insulation against cold, and very little heat is required to maintain a uniform degree of warmth.

VARIETIES OF SWEET POTATOES FOR MARKETING.

One problem that will naturally concern the farmer who contemplates growing sweet potatoes for market is the selection of varieties to plant. Throughout the eastern United States the yellow-skinned, yellow-fleshed, dry, mealy root is in favor. The principal varieties of this type are Big Stem Jersey, including the so-called Improved Big Stem, and the Yellow Jersey, of which there are several strains, known locally as Yellow Nansemond, Pepper's Choice, Early Carolina, Gold Coin, and Up-Rivers. The varieties and strains of the Jersey group mature quickly and are the most desirable for early marketing direct from the field.

In parts of the South and Southwest the variety known as Nancy Hall, sometimes called Muscatine, is rapidly growing in favor. It is a more vigorous grower than the Jersey varieties. Its roots are of the same general shape and color, but its flesh is a deeper yellow, and when cooked is moist and very sweet. It yields heavily, is a good keeper, and is in demand on all markets where the people are accustomed to a potato having moist flesh.

The Triumph is similar to the Nancy Hall, but its flesh is a little drier, and for that reason this variety is better adapted for the

northern markets. While the Nancy Hall and the Triumph varieties will keep well during the winter, they will not hold up for marketing through the spring months.

In order to extend the marketing period further it will be necessary to plant a portion of the acreage to one or more of the following varieties: Georgia Yam, Southern Queen or Hayman, Pumpkin Yam, and Dooley. These are excellent keepers and find a fair market during the spring. For canning purposes such varieties as Big Stem Jersey, Yellow Jersey, and Triumph should be planted, as the varieties having moist, soft flesh when cooked are not well adapted to canning.¹

HARVESTING SWEET POTATOES.

The most important factor in keeping sweet potatoes is careful handling. They should be dug with implements which will not cut or bruise the roots, and they should be taken from the field in padded baskets and spring wagons. For this reason a machine or elevator type of potato digger is not well suited to the digging of sweet potatoes. A digger of the plow type, having several rods attached to the moldboard, is better adapted for this work. (See fig. 7.) Sweet potatoes should not be dug when the ground is wet and sticky, but when it is in a suitable condition to work, so that the soil will not adhere to the potatoes. Following the digger, laborers rake the potatoes from the soil with their hands and leave them on the surface to dry. If possible, the digging should be done on a bright, sunshiny, windy day, so that the potatoes may lie exposed to the sun and wind for one or two hours before being hauled to the storehouse.

Some growers grade the potatoes in the field, while others gather everything into baskets and haul to sorting tables located in a shed alongside the storage house. Each method has its advantages, but on the whole it is more desirable to grade the potatoes in the field and then take them in baskets direct to the storage bins. In harvesting and storing, sweet potatoes should be handled as little as possible. In grading, the main thing is to separate from the marketable potatoes all that are cut, broken, or badly bruised, as well as any that are of irregular shape, extremely large, or too small. The smaller potatoes, commonly called "seed," include all that can be spanned by the thumb and second finger. When there is a greater quantity of seed stock than is needed for home use and for the next season's planting, the surplus may be sold locally at a low price or employed for fattening hogs. For the latter purpose they are worth about 25 cents a bushel.

The hamper basket, also called the Delaware basket, shown in figure 8, which holds approximately five-eighths of a bushel, is

¹ For information on the general culture of sweet potatoes, see Farmers' Bulletin 324, entitled "Sweet Potatoes," which will be sent free on application to a Member of Congress or to the Secretary of Agriculture.

commonly used for carrying the potatoes from the field. The baskets are hauled in a large spring wagon or an ordinary farm

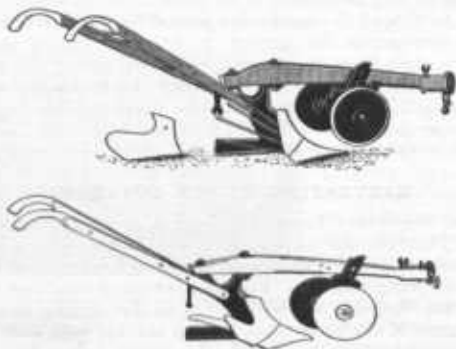


FIG. 7.—Special plows for digging sweet potatoes.

wagon with bolster springs, a rack being placed upon the bed to increase the carrying capacity. Figure 8 shows a wagon used by



FIG. 8.—Wagon adapted to hauling sweet potatoes from the field to the storage house or shipping point.

New Jersey and Maryland growers for this purpose. Sweet potatoes should never under any circumstances be handled or shipped in bags,

nor should they be hauled loose in a wagon or be shipped in bulk in cars. Any bruising that would break the shell of an egg will injure their keeping qualities.

The usual method of harvesting potatoes is to dig them during the early part of the day, gathering and hauling them later. No more potatoes should be dug than can be stored before nightfall, as exposure to the chilly night air will injure their keeping qualities.

STORING THE ROOTS.

As the baskets of sweet potatoes are brought from the field they are carried from the wagon by hand and emptied carefully into the bins. In filling the bins the workmen begin at the rear end, pouring the potatoes in a layer about 2 feet in depth over the entire surface. As a rule, the potatoes are then allowed to dry for a day or two before a second layer is put in. In the meantime, the first layer is being placed in other bins. In order to carry the second layer to the back of a large bin without walking upon the first layer, a few bags filled with straw are thrown upon the potatoes and on these planks are placed for the workmen to walk on. As the second layer is put in place the planks and bags of straw are removed. After a reasonable time for the second layer to become thoroughly dry a third layer is added in the same manner, the depth of potatoes being about 6 feet when the bin is filled. No straw or other material is placed between the layers.

While the potatoes are being brought into the storage house, fire is kept in the stove or heater, maintaining a temperature of 80° to 85° F., with plenty of ventilation. This heating or sweating process is continued about a week or ten days after the potatoes have all been brought in, the length of time required to properly cure them depending somewhat on their condition as well as on the variety. It will be necessary, however, to continue the curing process as long as the potatoes are giving off large quantities of moisture. One test for curing is the ease or difficulty with which the skin of the potato may be scraped off. If it can be easily removed the curing process must be continued. One of the main objects of the fire-drying process is to drive off the surface moisture and to heal any injury. When the curing is completed the temperature is allowed to fall gradually to about 54° or 55° F., where it is maintained throughout the storage period. If sprouting takes place the temperature should be lowered sufficiently to check it, but not low enough to endanger the roots. However, an occasional sprout is a good indication that the potatoes are keeping perfectly.

In some sections it may not be necessary to maintain a fire in the stove after the kiln-drying or curing process is completed. However, the stove should be allowed to remain in the house for use in case of

severely cold weather. Whenever the temperature of the storage house falls to 45° F. or below, the fire should be started. Sweet potatoes in storage are more often injured by being exposed to a low temperature than from any other cause. The house may be opened and aired freely on dry, windy days, but should be kept closed during rainy, moist weather. Sweet potatoes shrink from 8 to 15 per cent in storage. While there they should not be disturbed or handled until wanted for marketing. Even though a few potatoes are beginning to decay they are better left undisturbed, as the handling in sorting tends only to spread the disease. The driving of a nail in the side of a bin or heavy pounding in any part of the house will cause the potatoes to decay. When a bin is opened for marketing it is desirable to dispose of its entire contents without delay. Potatoes intended for seed should not be stored in the same bin with marketable ones, although they may be kept in the same house. Seed potatoes should, however, always be stored in a part of the house where they need not be disturbed until wanted for bedding in the spring.

MARKETING SWEET POTATOES.

One reason why southern farmers have not received more for their sweet potatoes is that they have not followed proper methods in marketing the crop. Frequently the potatoes are not only damaged in digging, but are put in bags or rough barrels without proper grading and rushed to market at a time when there is an oversupply. Low prices are the result. The secret of securing high prices for any perishable farm product is (1) to properly grade, clean, and pack it and (2) to place it upon the market at a time when there is the greatest demand for it. The period of greatest demand for the sweet potato is from the 1st of September to the 1st of April, and the highest prices usually prevail from the middle of December until the 1st of March. After this date the prices are either very high or comparatively low, according to the quantity that has been held in storage. To obtain the best prices it is necessary to have facilities for storing the crop from one to five months after harvesting.

No matter how thoroughly the grading had been done when the potatoes were stored it will be necessary to grade them again when taken from the bins and packed for market. Two commercial grades are usually made: The larger or overgrown potatoes go into the class known as "pie" stock, which is sold to restaurants for use in the manufacture of pies and for cutting into small portions. The "prime" grade consists of those 2 to 3 inches in diameter and 4 to 5 inches in length, or the proper size for an individual portion. Choice potatoes will not bring high prices unless separated from the other grades. One southern grower, who has achieved an enviable reputation for quality, selects with such care that his first grade is almost as

uniform in size and shape as if each potato had been turned on a lathe. It is, of course, impossible to secure a large percentage of extra-select stock, but a comparatively small quantity pays well for the trouble of selection.

The standard veneer potato barrel with burlap cover (fig. 9) is commonly employed for shipping sweet potatoes direct from the field. For shipments during cold weather standard double-headed stave barrels are employed. When the wooden head is used it should be pressed into place by means of a device, such



FIG. 9.—Standard potato barrel commonly used for the shipment of sweet potatoes during the summer months.

as that used by New Jersey growers (fig. 10). By this method very little pounding is necessary and the potatoes do not become bruised.

In marketing, sweet potatoes should be carefully handled and protected from cold. While the standard barrel is generally used, there



FIG. 10.—Sweet-potato barrels and a device for pressing the heads into place.

is a growing tendency to ship in smaller packages. Select sweet potatoes are now being marketed in several sizes and styles of baskets; also in fancy bushel crates. The demand for smaller packages, which can be delivered intact to customers, is increasing. Sweet potatoes offered in attractive packages, well filled and

graded, command a fair price, even when the markets are overstocked with inferior goods.

Whenever a sweet potato becomes thoroughly chilled or bruised decay sets in. In extremely cold weather the barrels and packages shipped should be covered with heavy building paper and the cars should be provided with sheet-iron stoves to keep out frost and to prevent chilling. A lining of paper in the barrel or basket will often prove an advantage. Under no consideration should sweet potatoes intended for market be shipped in bags or in bulk. The attractive bushel hamper basket and the veneer potato barrel are perhaps the most desirable packages to use in mild weather and the double-headed barrel and the bushel box when the weather is cold.

SUMMARY.

There is a constant and growing demand for sweet potatoes in the North and West, where the markets have not been sufficiently supplied.

The sandy, cut-over timber lands of the Southern States are well adapted to the growing of sweet potatoes.

Sweet potatoes may be marketed at a greater profit if provision is made for storing them during the autumn and early winter.

To keep well in storage, sweet potatoes must be well ripened, free from disease, carefully harvested, and properly housed.

An inexpensive building, in which the moisture and temperature conditions can be controlled, will answer for storing sweet potatoes.

During the curing period the temperature of the storage room should be maintained at from 80° to 85° F., and proper ventilation should be provided.

During the storage period there should not be a fluctuation of more than 5 degrees in either direction from a temperature of 54° F.

The varieties to grow are those demanded by the market and which will cover the longest season.

Sweet potatoes should be carefully graded when placed in the storage house and again when packed for market.

Sweet potatoes should never be marketed in bags or in bulk.

Veneer barrels with burlap covers and hamper baskets are the most desirable packages for mild weather and double-headed barrels and bushel boxes during cold weather.

With the growing demand for sweet potatoes in the markets of the North and West there is every inducement for southern farmers to adopt improved cultural and storage methods and make the sweet potato a more important money crop.